विद्या सर्वार्थि साधिका

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SUMMATIVE ASSESSMENT – 1
Class : XI

Subject : Physics M.M : 70
Date : 16/09/2016 Time : 3 Hours

General Instructions

1. All questions are compulsory. There are 26 questions in all.
2. This question paper has five sections: Section A, Section B, Section C, Section D and Section E.
3. Section A contains five questions of one mark each, Section B contains five questions of two marks each, Section C contains twelve questions of three marks each, Section D contains one value based question of four marks and Section E contains three questions of five marks each.
4. There is no overall choice. However, an internal choice has been provided in one question of two marks, one question of three marks and all the three questions of five marks. You have to attempt only one of the choices in such questions.

Section A

1. If the error in radius is 3%, what is the error in volume of sphere? (1)
2. Name the quantity which remains unchanged during the flight of an oblique projectile. (1)
3. What is a non-conservative force? (1)
4. What is the value of gravitational potential energy at infinity? (1)
5. A bob of a simple pendulum is set into an oscillation. What is the trajectory of the bob if the string is cut when the bob is at mean position? (1)

Section B

6. A train is moving with a velocity of 30km/h due east and a car is moving with a velocity of 40 km/h due north. What is the direction and magnitude of the relative velocity of car with respect to a passenger in the train? (2)
7. The pulley and strings shown in figure are smooth and of negligible mass. At what angle θ the system will be in equilibrium? (2)

8. A force $\vec{F} = (5\hat{\imath} + 4\hat{\jmath})\ N$ displaces a body through $\vec{s} = (3\hat{\imath} + 4\hat{k})m$ in 3s. Find the power. (2)

(OR)

Find the value of λ so that the vectors $\vec{A} = (2\hat{\imath} + \lambda\hat{\jmath} + \hat{k})$ and $\vec{B} = (4\hat{\imath} - 2\hat{\jmath} - 2\hat{k})$ are perpendicular to each other.

9. Two bodies of masses m_1 and m_2 have the same linear momentum. What is the ratio of their kinetic energies? (2)
10. A sphere of mass 40kg is being attracted by another sphere of mass 80 kg with a force equal to ¼ kg.wt when their centers are 30cm apart. Calculate the value of 'G'. (2)

Section C

11. The velocity of a body which has fallen freely under gravity varies as $g^p h^q$, where g is the acceleration due to gravity at the place and h is the height through which the body has fallen. Determine the value of p and q using dimensional analysis. (3)

12. What is parallax? How can you measure the distance of the moon by parallax method? (3)

13. (i) Distinguish between accuracy and precision (3)
(ii) Which of the following measurements is more accurate and why?
(a) 0.0002 g and (b) 20.0g

14. Starting from rest a car accelerates uniformly with $2m/s^2$ for 5s and then moves with uniform velocity. Draw distance-time graph of the motion of the car upto 7s. (3)

15. A body of mass 0.5kg travels in a straight with velocity $v = \propto x^{\frac{3}{2}}$ where $\propto = 5\ m^{\frac{-1}{2}}\ s^{-1}$. What is the work done by the net force during its displacement from x = 0 to x = 2m? (3)

16. Using calculus method (or) graphical method deduces the following equations for uniformly accelerated motion. (3)
(i) $x - x_o = v_o t + \frac{1}{2}at^2$ and $(ii)\ x_{nth} = v_o + \frac{a}{2}(2n-1)$

17. In figure, find the acceleration a of the system and the tensions T_1 and T_2 in the strings. Assume that the table and the pulleys are frictionless and the strings are massless. Take $g = 10m/s^2$. (3)

18. The position of a particle is given by $\vec{r} = (3.0t\hat{\imath} + 2.0t^2\hat{\jmath} + 5.0\hat{k})$ where t is in seconds and the coefficients have the proper units for r to be in metres. (3)
(i) Find v(t) and a(t) of the particle
(ii) Find the magnitude and direction of v(t) at t = 3.0s.

(OR)

A particle starts from origin at t= 0 with a velocity $5.0\hat{\imath}$ m/s and moves in x-y plane under the action force which produces constant acceleration of $(3.0\hat{\imath} + 2.0\hat{\jmath})\ m/s^2$.
(i) What is the y-coordinate of the particle at the instant the x-coordinate is 84m?
(ii) What is the speed of the particle at that time?

19. Derive the relation between linear velocity and angular velocity. (3)

20. Discuss the variation of 'g' with depth. What happens to 'g' at the centre of earth? (3)

21. Show that the gravitational potential at a point of distant r from the mass m is given by, $V = -\frac{GM}{r}$. (3)

22. Explain why (3)
(i) a horse cannot pull a cart and run in empty space.
(ii) it is easier to pull a lawn mower than to push it.
(iii) a cricket player lowers his hands to catch the ball safely.

Section D

23. Ram was driving his car at a speed of 80 km/h along a straight road for 8km. Then the car suddenly ran out of petrol. He kept himself cool and walked for 30min to reach a petrol pump at a distance of 2km. (4)
(i) What were the values displayed by Ram?
(ii) What was the average velocity from the beginning of his drive till he reached the petrol pump?

Section E

24. (i) Derive an expression for the elastic potential energy stored in a stretched spring. Show this energy graphically. (5)

(ii) Show that the elastic force of a spring is a conservative force.

(iii) Two springs of force constants K_1 and K_2 respectively ($K_1 > K_2$) are stretched by applying the same force. Which spring has done more work?

(OR)

(i) Differentiate elastic and inelastic collisions.

(ii) A bullet is fired into a block of wood. If gets totally embedded in it and the system moves together as one entity, then state what happens to the initial kinetic energy of the bullet? Derive necessary equation.

25. (i) What is meant by banking of road? (5)

(ii) What is the need for banking a road?

(iii) Draw a force diagram of a moving body negotiating a curve of radius R in a banked road. Obtain the expression for the maximum possible velocity of the body. Also find the velocity when the friction is zero.

(OR)

A body attached to a string of length 'l' describes a vertical circle such that it is just able to cross the highest point. Find minimum velocity at the

(i) bottom and (ii) highest point of the circle. Also draw relevant vector diagram.

26. (i) Derive an expression for (a) Maximum height and (b) horizontal range for a projectile thrown upwards, making an angle θ with the horizontal direction. (5)

(ii) What will be the effect on maximum height of a projectile when its angle of projection is changed from 30^o to 60^o, keeping the same initial velocity of projection?

(OR)

(i) Analytically, find the resultant $\vec{R}$ of two vectors $\vec{A}$ and $\vec{B}$ inclined at an angle θ.

(ii) Two vectors, both equal in magnitude, have their resultant equal in magnitude of the either. Find the angle between the two vectors.